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Relationship between Use of Labor Pain Medications and Delayed Onset of Lactation

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Abstract

Background—Despite estimates that 83% of mothers in the United States receive labor pain medications, little research has been done on how use of these medications affect onset of lactation.

Objective—To investigate whether use of labor pain medications is associated with delayed onset of lactation (DOL).

Methods—We analyzed data from the 2005-2007 Infant Feeding Practices Study II, a longitudinal study of women from late pregnancy through the entire first year after birth (n = 2366). In multivariable logistic regression analyses, we assessed the relationship between mothers' use of labor pain medication/method and DOL (milk coming in > 3 days after delivery).

Results—Overall, 23.4% of women in our sample experienced DOL. Compared with women who delivered vaginally and received no labor pain medication, women who received labor pain medications had a higher odds of experiencing DOL: vaginal with spinal/epidural only (aOR 2.05; 95% CI, 1.43-2.95), vaginal with spinal/epidural plus another medication (aOR 1.79; 95% CI, 1.16-2.76), vaginal with other labor pain medications only ([not spinal/epidural]; aOR 1.84; 95%

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Well Established

Delayed onset of lactation (DOL) is associated with early cessation of breastfeeding; shorter breastfeeding duration is associated with a higher risk for infections and sudden infant death syndrome in infancy, and for diabetes and potentially obesity later in life.

Newly Expressed

Mothers who received labor pain medications were more likely to experience DOL, regardless of delivery method. Further research is needed to understand whether interventions that provide additional breastfeeding support to women who receive labor pain medications can improve breastfeeding outcomes.

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

CI, 1.14-2.98), planned cesarean section with spinal/epidural only (aOR 2.13; 95% CI, 1.39-3.27), planned cesarean with spinal/epidural plus another medication (aOR 2.67; 95% CI, 1.35-5.29), emergency cesarean with spinal/epidural only (aOR 2.17; 95% CI, 1.34-3.51), and emergency cesarean with spinal/epidural plus another medication (aOR 3.03; 95% CI, 1.77-5.18).

Conclusion—Mothers who received labor pain medications were more likely to report DOL, regardless of delivery method. This information could help inform clinical decisions regarding labor/delivery.

Keywords

breastfeeding; lactation; labor and delivery; medication; risk factors

Background

Breastfeeding is an effective preventive health measure that reduces the risk of infections and sudden infant death syndrome (SIDS) in infancy, and for diabetes and potentially obesity later in life.[1] The American Academy of Pediatrics (AAP) recently reaffirmed its recommendations of exclusive breastfeeding for about the first 6 months of life and continued breastfeeding for the first year of life and beyond.[2] These recommendations are also supported by the American College of Obstetricians and Gynecologists (ACOG).[3]

Given the numerous benefits of breastfeeding and current recommendations, it is important to evaluate predictors of early breastfeeding cessation. Delayed onset of lactation (DOL), typically defined as onset of copious milk secretion more than 72 hours postpartum,[4-7] is associated with shorter breastfeeding durations.[4,5,8] A previous study found that among women who intended to breastfeed for at least 6 months, onset of lactation ≥ 72 hours postpartum was associated with substantially shorter breastfeeding duration than onset of lactation < 72 hours postpartum (median breastfeeding durations: 3.4 months and 11.7 months, respectively).[8] In a recent analysis using the same sample population as this study, DOL was associated with cessation of any and exclusive breastfeeding at 4 weeks postpartum.[5] Known risk factors for DOL include primiparity,[9,10] cesarean section (cesarean),[6,9,10] maternal over-weight/obesity,[6,10,11] prolonged second stage labor,[6] low infant birth weight,[6] supplementation before the onset of lactation,[6] maternal age,[11] psychosocial stress or pain,[10] stressful labor and delivery,[10] and delayed first breastfeed.[10]

Data from a national survey estimate that 83% of mothers in the United States use 1 or more types of medication during labor and delivery for pain relief, with epidural or spinal analgesia being the most common forms (67% of women).[12] However, despite the high prevalence of pain medication use during labor, little research has been done on how labor pain medications may be associated with onset of lactation.[7,13] Our objective was to investigate whether use of labor pain medications was associated with DOL among women who initiated breastfeeding.

Methods

Study Population and Data Collection

The Infant Feeding Practices Study II (IFPS II) is a longitudinal study of mothers and infants, following women from late pregnancy through 12 months postpartum.[14] The IFPS II was conducted by the US Food and Drug Administration (FDA) in collaboration with the Centers for Disease Control and Prevention (CDC) to understand infant feeding patterns, infants' health, factors that may affect infant feeding, and mothers' health and diet. Data were collected from May 2005 through June 2007 using a nationally distributed consumer opinion panel. Eligible women consisted of pregnant women 18 years of age or older who gave birth to a healthy singleton infant with a gestational age of ≥ 35 weeks and a birth weight of ≥ 5 pounds. Detailed study methods have been published elsewhere.[14]

IFPS II data were collected longitudinally with a prenatal questionnaire, a short telephone interview near the infant's birth, a neonatal questionnaire sent when the infant was approximately 1 month old, and approximately monthly questionnaires through 12 months of age. All questionnaires and procedures were approved by the FDA's institutional review board and the US Office of Management and Budget. This analysis only uses data from the prenatal and neonatal questionnaires. In addition, because only mothers who initiated breastfeeding in the IFPS II were asked about the timing when their milk came in, our analyses were further limited to mothers who reported ever breastfeeding (n = 2586).

Variable Definitions

As a part of the neonatal questionnaire, women were asked, "How long did it take for your milk to come in?" (1 day or less, 2 days, 3 days, 4 days, more than 4 days). To be consistent with previous research, we dichotomized responses to create our main outcome variable, DOL, with mothers reporting their "milk coming in" > 3 days after delivery classified as having DOL and ≤ 3 days as not having DOL.[4-7]

Analyzing the association between labor pain medication use and DOL is challenging due to significant interactions between mode of delivery and use of labor pain medications.[15] In an effort to control for this effect, we created a composite predictor variable that combined labor pain medication use and method of delivery. The neonatal questionnaire asked, "Which of the following medications did you have during labor or delivery?" Mothers were allowed to select all that apply: general anesthesia (you were put to sleep); a spinal or epidural; Demerol or Stadol; nitrous oxide (gas breathed through a mask or mouthpiece while remaining conscious); pudendal block or other local blocks (injections into the vagina or cervix before the birth); other pain medication/don't know which pain medication; or no pain medication. In this analysis, we classified the use of these pain medications into 4 mutually exclusive groups (no medication, spinal/epidural only, spinal/epidural plus another pain medication, and other labor pain medication use only [not spinal/epidural]). Method of delivery was categorized as vaginal, planned cesarean, and emergency cesarean. The combination of pain medication use and method of delivery resulted in 8 mutually exclusive groups: (1) vaginal with no medication (reference group); (2) vaginal with spinal/epidural only; (3) vaginal with spinal/epidural plus another medication; (4) vaginal with other labor

pain medications only (ie, general anesthesia; Demerol or Stadol; nitrous oxide; pudendal block or other local blocks; and other pain medication or don't know which pain medication); (5) planned cesarean with spinal/epidural only; (6) planned cesarean with spinal/epidural plus another medication; (7) emergency cesarean with spinal/epidural only; and (8) emergency cesarean with spinal/epidural plus another medication. The “other labor pain medications only” category was dropped for planned cesareans and emergency cesareans due to the small number of women in these groups.

Potential covariates included maternal age (18-24, 25-29, 30-34, and ≥ 35 years), race/ethnicity (white, black, Hispanic, and other), maternal education (high school or less, some college, college graduate, and not specified), poverty-to-income ratio ([PIR]; a comparison of how a family's or person's income compares with the poverty threshold, with higher percentages including higher incomes;[16] < 185%, 185%-349%, and ≥ 350%); prepregnancy body mass index (BMI [kg/m^2]; < 18.5, 18.5-24.9, 25.0-29.9, and ≥ 30); geographic residential location (based on state of residence; Northeast, Midwest, South, and West); parity (primiparous and multiparous); marital status (married, unmarried, and not specified); intended breastfeeding duration (≤ 2 months, 3-4 months, 5-6 months, ≥ 7 months, and not specified); infant birth weight (< 2500 grams, 2500-3600 grams, and > 3600 grams); and number of “Baby-Friendly” hospital practices experienced (0-2 practices, 3-4 practices, and 5-6 practices). Ten Baby-Friendly evidence based maternity care practices have been identified by the World Health Organization/United Nations Children's Fund's Baby-Friendly Hospital Initiative (BFHI) to support breastfeeding and are associated with positive breastfeeding outcomes.[17] Six of the 10 Baby-Friendly hospital practices are measured through mother's report in IFPS II. Five of the practices may have possible biological influences on DOL (breastfeeding within 1 hour of birth, giving only breast milk, rooming in, breastfeeding on demand, and not giving pacifiers) and the sixth practice, providing information on postdischarge support, could play a potential role in DOL if the mother was discharged from the hospital prior to the onset of lactation. Therefore, we used all 6 practices to create the covariate representing the number of Baby-Friendly hospital practices mothers received.[18]

Statistical Analyses

SAS 9.3 (SAS Institute, Inc, Cary, North Carolina, USA) was used for all analyses. We used bivariate analyses to compare mothers with and without DOL by labor pain medication/method of delivery group, maternal socio-demographic characteristics, and the number of Baby-Friendly hospital practices received. Variables with a P value < .05 in χ^2 tests were considered statistically significant and retained as covariates in the modeling analyses. Logistic regression was used to model the association between DOL and labor pain medication use/method of delivery. The adjusted model controlled for PIR, BMI, geographic residential location, parity, intended breastfeeding duration, and number of Baby-Friendly hospital practices received.

Results

IFPS II enrolled 3033 women who completed a prenatal and postnatal questionnaire, with 2586 of these women reporting ever breastfeeding. Of these, 98.8% (n = 2555) had complete data for time of onset of lactation. After excluding 20 women who received labor pain medications other than a spinal/epidural during their cesarean and 15 women who were missing labor pain medication data, 2520 women remained. Mothers were also excluded from the analysis if they were missing data on potential covariates (n = 154), resulting in a final analytic sample of 2366. Mothers who initiated breastfeeding and were excluded from this analysis for missing data were more likely to be younger, to be unmarried, to have intended prenatally to breastfeed for ≤ 2 months, and to have received only 0-2 Baby-Friendly hospital practices compared with mothers who were included in this analysis; other characteristics were similar among the groups.

The majority of women in the sample were 25 to 34 years old, white, with more than a high school education, a PIR ≥ 185%, were multiparous, married, and intended prenatally to breastfeed for ≥ 5 months (Table 1). Approximately half of the women were overweight or obese (49.3%) and 69.8% reported receiving 3 or more of the 6 Baby-Friendly hospital practices measured in this study. Nearly three-quarters of women delivered their infants vaginally (73.2%), 60.3% delivered an infant that weighed 2500-3600 grams, and 84.1% reported receiving some form of pain medication during labor or delivery. The proportions of women in the various pain medication/method of delivery groups ranged from 2.3% having a planned cesarean with a spinal/epidural plus another medication to 37.7% having a vaginal birth with a spinal/epidural only.

Overall, 23.4% of women experienced DOL (Table 2). The prevalence of DOL differed by labor pain medications/method of delivery, PIR, prepregnancy BMI, geographic residential location, parity, intended breastfeeding duration, and number of Baby-Friendly hospital practices received. DOL prevalence was lowest among women who delivered vaginally and received no labor pain medication (11.4%). Regardless of method of delivery, women who used labor pain medication reported higher rates of DOL, with the highest rate among women who had an emergency cesarean and received a spinal/epidural plus another medication (42.2%). The prevalence of DOL did not differ by maternal age, race/ethnicity, maternal education, marital status, or infant birth weight ($P \geq .05$).

Significant differences were found in reported day of onset of lactation by labor pain medication/method of delivery (Figure 1; $P < .0001$). Approximately 88.6% of women who delivered vaginally and received no labor pain medications reported that their milk came in within 3 days postpartum, with 53.1% of these women reporting onset of lactation by day 2. Conversely, only 57.8% of women who had an emergency cesarean and received a spinal/epidural plus another medication reported onset of lactation by 3 days postpartum.

In logistic regression analyses, mothers who received pain medications during labor and delivery were consistently more likely to experience DOL compared to mothers who received no labor pain medication (Table 3). In analyses adjusting for maternal socio-demographic characteristics, behavioral characteristics, and number of Baby-Friendly

hospital practices received, all labor pain medication groups regardless of method of delivery had higher odds of DOL compared to the reference group. The highest odds ratio for the association between labor pain medications/method of delivery and DOL was observed among women with the combination of an emergency cesarean and spinal/epidural plus another medication (adjusted odds ratio [aOR] 3.03; 95% confidence interval [CI], 1.77-5.18). Covariates in our logistic regression model that significantly predicted DOL included prepregnancy BMI, parity, intended breastfeeding duration, and number of Baby-Friendly hospital practices received. Compared to women with a prepregnancy BMI of 18.5-24.9, women with a prepregnancy BMI of 25.0-29.9 or ≥ 30 had increased odds of DOL in the adjusted models (aOR 1.28; 95% CI, 1.01-1.63 and aOR 1.30; 95% CI, 1.01-1.68, respectively). Primiparous women had an increased odds of DOL compared to multiparous women (aOR 2.12; 95% CI, 1.69-2.66). Women who intended to breastfeed ≤ 2 months or 5-6 months had increased odds of DOL compared to women who intended to breastfeed for ≥ 7 months (aOR 1.78; 95% CI, 1.11-2.86 and aOR 1.37; 95% CI, 1.06-1.77, respectively). And compared to women who experienced 5-6 of the 6 Baby-Friendly hospital practices measured in this study, women who reported receiving only 0-2 practices had increased odds of DOL (aOR 1.36; 95% CI, 1.01-1.83).

To understand whether the change of definition for DOL may yield different results, we conducted sensitivity analyses in which DOL was defined as milk coming in ≥ 3 days after delivery. There were almost no changes in the results and statistical significance ($P < .05$) was retained for all labor medication/method of delivery categories (data not shown), with the exception of women who delivered vaginally and received other labor pain medications only (aOR 1.34; 95% CI, 0.94-1.92). Furthermore, to understand whether the induction of vaginal births may yield different results from those that are not induced, we also conducted sensitivity analyses in which the vaginal birth category was separated out into induced vaginal deliveries and not induced vaginal deliveries. We used the same labor pain medication groupings as our main analysis, which resulted in 12 mutually exclusive groups, with the reference group becoming noninduced vaginal births with no medication. In adjusted analyses, all labor pain medication/method of delivery categories had significantly higher odds of DOL compared to the new reference group, with the exception of women who delivered vaginally, were not induced, and received a spinal/epidural plus another medication (n = 120) and women who delivered vaginally, were induced, and received no medications (n = 75; data not shown). However, the small sample sizes for these groups may have limited our ability to detect statistically significant associations.

Discussion

Overall, 23.4% of women in our sample reported experiencing DOL, with increasing prevalence by labor pain medication use and cesarean delivery. Across all groups of labor pain medication and delivery method, mothers who received labor pain medications had approximately 2-3 times higher odds of experiencing DOL compared to mothers who received no labor pain medications and delivered vaginally. Labor pain medication use in combination with a cesarean was more likely to be associated with DOL, with the strongest association among women who received pain medication and had an emergency cesarean.

Levels of pain medication use during labor and delivery shown here are comparable to national estimates.[12] To our knowledge, only 2 other studies have evaluated the effect of labor medications on onset of lactation.[7,13] In 1 study evaluating lactogenesis time, which they defined as the time between delivery and the surge in milk production, it was found that sedative or pain medication given during labor increased lactogenesis time by 13 hours in multivariate analyses.[13] Dewey et al[7] found in their bivariate analyses that DOL was more common in mothers who received labor pain medications, an association that did not remain significant in multivariate analyses when controlling for mode of delivery and 29 other variables.

Most pain medications used during labor and delivery are highly lipid soluble, crossing the placenta and rapidly diffusing into the fetus (ie, bupivacaine, meperidine, fentanyl, and sufentanil).[19,20] Many studies have shown an association between maternal receipt of labor pain medications and suboptimal infant breastfeeding behavior, including diminished early sucking.[21-27] Poor infant suckling ability and other suboptimal infant breastfeeding behaviors can affect an infant's ability to latch on to the breast effectively and extract milk, as well as to effectively stimulate the breasts, which could potentially influence onset of lactation.[10,15] The reproductive hormone oxytocin also plays a major role in lactation, as oxytocin is essential for the milk ejection reflex and milk removal from the mammary gland.[10] Administration of epidural analgesia during labor has been shown to decrease maternal plasma oxytocin levels.[28,29] These mechanisms could potentially explain our finding that labor pain medications were associated with increased odds of DOL.

This study has several strengths. The data are from a large, prospective, longitudinal study that allowed for sufficient statistical power to analyze the effect of multiple groupings of labor pain medications by method of delivery on onset of lactation. The short recall period for the prenatal and neonatal questionnaires minimized recall bias that may have occurred if mothers had been asked about labor/delivery and onset of lactation later in her child's life. We also controlled for multiple covariates that may confound the association between labor pain medication and DOL in our multivariate analyses. The complex effects of both pain medication use and delivery method on DOL were taken into consideration by combining these 2 variables as the main exposure variable in the multivariate modeling analysis.

This study is subject to at least 6 limitations. First, although well distributed throughout the United States, the study sample is not representative of the US population due to data being collected from a consumer mail panel in which black and Hispanic mothers, as well as mothers from lower socioeconomic statuses were underrepresented, which prevents generalization of our findings to the entire US population. Second, IFPS II did not collect information regarding dose of labor pain medication used or timing of medication administration; therefore a dose-response relationship between pain medication dosage and risk for DOL could not be examined. Third, while overall this was a large study, there were relatively small percentages of mothers exposed to some of the pain medications, which necessitated the broad groupings for labor pain medications other than spinal/epidural and limited our ability to evaluate the effects of specific medications. Fourth, because we are unable to separate cesareans from labor pain medication use, we are unable to evaluate the effects of the medications used independent of method of delivery. Similarly, we are unable

to separate the pain associated with labor/delivery from the use of labor pain medications; therefore, we are unable to tease out whether it is the pain or the pain medications leading to the associations that we observed with DOL. Fifth, data regarding labor course were not collected in IFPS II; therefore we were unable to adjust for labor characteristics such as length of labor, length of second stage labor, or labor/delivery stress, all of which are known to be associated with DOL. Finally, all data were self-reported; hence outcome and exposure misclassification are potential limitations of the study.

Conclusion

In conclusion, mothers who received pain medications during labor and delivery were more likely to report that they experienced DOL. Because 83% of mothers in the U.S. use pain medication during labor and delivery,[12] the implications of a link found between labor pain medications and onset of lactation, if causal, is of public health and clinical importance. Understanding why this association exists and whether interventions that provide additional breastfeeding support to women who receive labor pain medications can improve breastfeeding outcomes could help inform clinical decisions regarding labor and delivery. Future studies capable of assessing the effects of specific labor pain medications, medication dosages, and individual BFHI steps on onset of lactation, with detailed information regarding labor course which would allow adjustment for labor characteristics, and that also include women who did not initiate breastfeeding are warranted.

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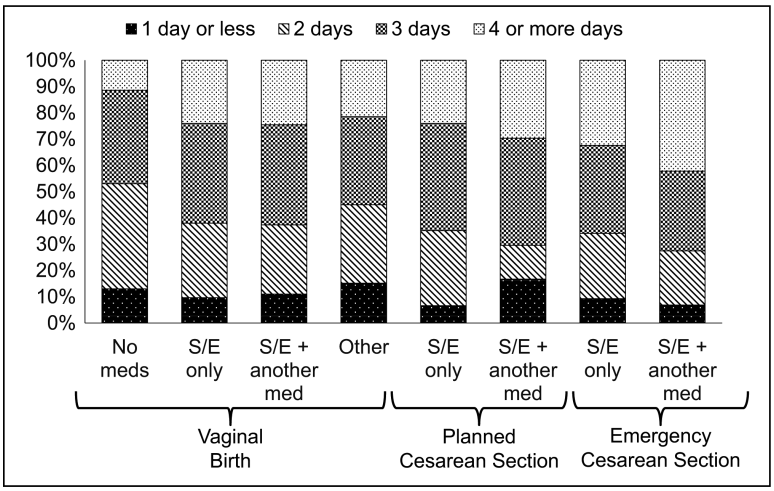

Figure 1.

The Prevalence of Reported Onset of Lactation Postpartum by Labor Pain Medication Category/Method of Delivery.

Abbreviations: Other, other labor pain medications only; meds, labor pain medications; S/E, spinal/epidural.

Table 1

Sample Characteristics of Women Who Initiated Breastfeeding (n = 2366), IFPS II, 2005-2007.

Variable	n	%
Total	2366	100.0
Labor pain medications		
Vaginal birth		
No medication	377	15.9
Spinal/epidural only	892	37.7
Spinal/epidural plus another medication	273	11.5
Other labor pain medications only	191	8.1
Planned cesarean section		
Spinal/epidural only	304	12.9
Spinal/epidural plus another medication	54	2.3
Emergency cesarean section		
Spinal/epidural only	173	7.3
Spinal/epidural plus another medication	102	4.3
Maternal age, y		
18-24	505	21.3
25-29	826	34.9
30-34	657	27.8
≥ 35	378	16.0
Race/ethnicity		
White	1983	83.8
Black	113	4.8
Hispanic	152	6.4
Other	118	5.0
Maternal education		
High school or less	407	17.2
Some college	911	38.5
College graduate	931	39.4
Not specified	117	5.0
Poverty-to-income ratio		
< 185%	940	39.7
185%-349%	863	36.5
≥ 350%	563	23.8
Prepregnancy BMI, kg/m^2		
< 18.5	105	4.4
18.5-24.9	1096	46.3
25.0-29.9	621	26.3
≥ 30	544	23.0
Geographic residential location		
Northeast	382	16.2

Variable	n	%
Midwest	689	29.1
South	758	32.0
West	537	22.7
Parity		
Primiparous	711	30.1
Multiparous	1655	70.0
Marital status		
Married	1816	76.8
Unmarried	424	17.9
Not specified	126	5.3
Intended breastfeeding duration, mo		
≤ 2	91	3.9
3-4	175	7.4
5-6	432	18.3
≥ 7	1457	61.6
Not specified	211	8.9
Infant birth weight, g		
< 2500	36	1.5
2500-3600	1427	60.3
> 3600	903	38.2
Number of Baby-Friendly hospital practices received		
0-2 practices	713	30.1
3-4 practices	1094	46.2
5-6 practices	559	23.6

Abbreviation: BMI, body mass index.

Table 2

Prevalence of Delayed Onset of Lactation among Women Who Initiated Breastfeeding, by Significant Sociodemographic, Behavioral, and Birth Characteristics, IFPS II, 2005-2007.

Variable	N	% Delayed Onset of Lactation	*P* Value[a]
Total	2366	23.4	
Labor pain medications			< .0001
Vaginal birth			
No medication	377	11.4	
Spinal/epidural only	892	24.0	
Spinal/epidural plus another medication	273	24.5	
Other labor pain medications only	191	21.5	
Planned cesarean section			
Spinal/epidural only	304	24.0	
Spinal/epidural plus another medication	54	29.6	
Emergency cesarean section			
Spinal/epidural only	173	32.4	
Spinal/epidural plus another medication	102	42.2	
Poverty-to-income ratio			.0153
< 185%	940	21.3	
185%-349%	863	22.8	
≥ 350%	563	27.7	
Prepregnancy BMI, kg/m^2			.0106
< 18.5	105	14.3	
18.5-24.9	1096	21.5	
25.0-29.9	621	25.6	
≥ 30	544	26.3	
Geographic residential location			.0365
Northeast	382	23.6	
Midwest	689	20.0	
South	758	26.5	
West	537	23.1	
Parity			< .0001
Primiparous	711	34.6	
Multiparous	1655	18.6	
Intended breastfeeding duration, mo			.0019
≤ 2	91	33.0	
3-4	175	26.9	
5-6	432	28.2	
≥ 7	1457	20.8	
Not specified	211	24.2	
Number of Baby-Friendly hospital practices received			< .0001
0-2 practices	713	28.3	

Variable	N	% Delayed Onset of Lactation	*P* Value[a]
3-4 practices	1094	23.3	
5-6 practices	559	17.2	

Abbreviation: BMI, body mass index.

[a]All comparisons done using χ^2 tests.

Table 3

Association between Delayed Onset of Lactation and Labor Pain Medication/Method of Delivery (n = 2366).

Labor Pain Medication/Method of Delivery	Crude OR (95% CI)	aOR[a] (95% CI)
Vaginal birth		
No medication	Reference	Reference
Spinal/epidural only	2.45 (1.72-3.49)	2.05 (1.43-2.95)
Spinal/epidural plus another medication	2.53 (1.66-3.85)	1.79 (1.16-2.76)
Other labor pain medications only	2.12 (1.33-3.39)	1.84 (1.14-2.98)
Planned cesarean section		
Spinal/epidural only	2.45 (1.63-3.71)	2.13 (1.39-3.27)
Spinal/epidural plus another medication	3.27 (1.68-6.36)	2.67 (1.35-5.29)
Emergency cesarean section		
Spinal/epidural only	3.72 (2.37-5.83)	2.17 (1.34-3.51)
Spinal/epidural plus another medication	5.66 (3.42-9.38)	3.03 (1.77-5.18)

Abbreviations: aOR, adjusted odds ratio; CI, confidence interval; OR, odds ratio.

[a]Adjusted for poverty-to-income ratio, prepregnancy body mass index, geographic residential location, parity, intended breastfeeding duration, and number of Baby-Friendly hospital practices received.